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3/20/96

MONTGOMERY WATSON

March 20, 1996

Ms. Sheri Bianchin, RPM
United States Environmental Protection Agency
Region V (HSR-6J)
77 West Jackson Blvd.
Chicago, IL 60604-3590

RE: Construction of the Perimeter Groundwater Containment System
American Chemical Service, Inc. Superfund Site
Griffith, Indiana

Dear Ms. Bianchin:

As we discussed in our meeting on March 14, 1996, implementation of the Perimeter Groundwater Containment System (PGCS) is a critical element in preventing further off-site migration of contaminated groundwater in the upper aquifer to the west and northwest of the ACS Site. Consequently, an expedited schedule was established for this component of the remedy, and our goal is to have the PGCS operational this year. In order to meet this schedule, and as approved by U.S. EPA, we are using the design/build approach and therefore detailed drawings and specifications will not be prepared and submitted to U.S. EPA and IDEM for review. As-built drawings will be developed following construction and submitted to the U.S. EPA. It is our understanding that your reviews will focus mainly on the conceptual layout and on the performance standards to be met by the PGCS instead of on the specific details of the construction.

As you stated in the March 14th meeting, the impacts that the recent field screening data have on the length and location of the extraction trench and the estimated extraction rate need to be assessed before finalizing the size of equipment. We have completed this assessment and we will be extending the extraction trench approximately 300 feet further to the east than what is shown in the PGCS 50 Percent Design Submittal. The extraction rate is estimated to increase from 12 gpm (at steady state) to 15 gpm. This increase will not impact the sizes of the treatment equipment. The details of the hydrogeologic analysis are summarized in the attached Technical Brief.

In addition to extending the extraction trench, we propose to add a fourth set of piezometers to document the performance of the trench. As we discussed at the meeting, the revised Performance Standard Verification Plan will be a part of the PGCS 100 Percent Design Submittal and it will include a discussion of chemical analysis of monitoring well samples. The chemical sampling would be performed as part of the quarterly monitoring plan which will be developed and submitted separately. The Upper Aquifer Technical Memorandum, submitted on March 18, 1996 has proposed the installation of two additional monitoring wells north of the extraction trench area. These wells will be useful in confirming the effectiveness of the trench.

Given the aggressive goal for implementing the PGCS this year, it is essential that we begin procuring the treatment equipment by the first week of April. Consequently, this letter is intended to be a formal request for approval to procure and install the major components of the PGCS. Based on discussions at our meeting last week, we anticipate confirmation of this request by March 27, 1996.

If you need additional information or have any questions or concerns, please don't hesitate to contact me at (708) 691-5020. We appreciate your prompt attention to this matter and look forward to successfully implementing this component of the remedy.

Sincerely,

MONTGOMERY WATSON

Peter J. Vagt, Ph.D, CPG
Vice President

Enclosure: Technical Brief: Proposal to Modify the Groundwater Extraction Trench

cc: Holly Grejda/IDEM
Steve Mrkvika, B&VWS
Steve Mangion, U.S. EPA HQ
Ron Schlicher
ACS Technical Committee

RJS/PJV
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TECHNICAL BRIEF

PROPOSAL TO MODIFY THE GROUNDWATER EXTRACTION TRENCH
PERIMETER GROUNDWATER COLLECTION (PGCS) SYSTEM
ACS NPL SITE RD/RA

BACKGROUND

A two-part upper aquifer investigation is being conducted at the ACS NPL Site as part of the RD/RA Pre-Design Investigation. The first part, a field screening exercise, has been completed and has delineated the extent of volatile organic compound (VOC) contamination in the upper aquifer surrounding the site. The second part will be the installation of several additional monitoring wells for the purposes of confirming the field screening delineation and acting as sentinel wells to detect changes in the plume condition over time.

The field screening data indicate that a plume of contaminated groundwater (primarily benzene and acetone) is migrating off-site to the north of the ACS facility, at a location more to the east than previously identified. Figure 1, modified from the Upper Aquifer Technical Memorandum, shows the extent of the contaminated groundwater and the proposed locations for additional monitoring wells to confirm the findings from the field screening.

To accomplish the purpose of the PGCS, it will be necessary to extend the extraction trench further to the east than indicated in the PGCS 50 Percent Design document that was submitted to U.S. EPA on March 14, 1996. This Technical Brief summarizes the hydrogeologic analysis used to determine if modifications to the proposed extent of the groundwater extraction trench will accomplish the objective of preventing further off-site migration of contaminated groundwater to the north and west in the upper aquifer.

The groundwater extraction component in the PGCS 50 Percent Design submittal is an "L-shaped" trench, aligned between the ACS facility and the wetland areas on the west and northwest side of the site (Figure 1). The United States Geological Survey (USGS) groundwater models Modflow© and Modpath© were used in evaluating the groundwater extraction capabilities of the extraction trench. The models were implemented with the software package *Visual Modflow*©, by Waterloo Hydrogeologic Software.

GROUNDWATER MODELING

A single-layer, 31-column, 31-row finite difference model was developed with site specific data from the remedial investigation and subsequent investigations including the pumping test. Figure 2 shows an overlay of the finite difference grid for the modeling on the northern part of the ACS site where the PGCS extraction trench is located. Three modeling runs were conducted. "ACS-A" was a model run to establish the baseline conditions that created the zone of VOC contamination extending west and north from the site. "ACS-B" was a model run to assess the capture zone that would be established from the extraction trench alignment that was included in the PGCS 50 Percent Design submittal. "ACS-C" was a model run with the extraction trench extended 300 feet further to the east. ACS-C was the model run that was successful in simulating the prevention of off-site groundwater contamination migration.

Figures 3 through 5 show the final output from the three modeling runs. Three types of lines are included on the plots. 1) The straight lines show the roads, railroads and fence lines surrounding the ACS facility. The irregularly shaped "square" along the west side of the plots (approximately 4400 east and 7000 north) represents the Griffith Landfill dewatering area. 2) The watertable contour lines are generally curved, and have numbers showing the watertable elevation resulting from the model run. 3) The lines with arrow heads are the "particle tracks" showing the direct migration pathways that would be followed by contamination in the upper aquifer.

The model was operated to be conservative and under-estimate potential hydraulic control, rather than to over-estimate it. While the PGCS system has been designed for a four-foot drawdown of the static water table, the modeling was conducted to simulate a one-foot drawdown of the static water level. The actual drawdown necessary to maintain hydraulic control will be established in the field using a combination of existing monitoring wells and piezometers and new wells and piezometers.

ACS-A Model Run (Baseline)

The modeled watertable contour lines on Figure 3 (labeled with groundwater elevations) are a close match to the contour map developed from the water levels measured at the site in October 1995 (Figure 1). Modpath© was used to represent the primary migration pathways of organic contamination away from the ACS site. The sources of VOCs were represented with twenty-five "particles" in a circle inside the ACS facility. Modpath© was used to model the movement of the particles through the upper aquifer. The resulting pathlines show the development of a plume with the same general extent of the plume delineated in the field with the field screening investigation (Figure 1).

It is important to note that Modpath© is not a contaminant transport model; it is a "particle tracking" model. A particle tracker shows the probable direct flow lines that groundwater will be expected to follow. A natural groundwater plume, (and one simulated by a *contaminant transport* model), would show a plume with high contaminant concentrations in the core of the plume and with trace concentrations at distal locations along both the front and the sides of the plume. The particle tracker does not represent concentrations, but plots the direct pathway that contaminants would follow without the effects of dispersion, diffusion, and attenuation. Since a particle tracker was used in this evaluation, there are two primary differences between the field screening plot of the groundwater contamination and the results of the Modpath© modeling:

- The particle paths shown do not account for the low levels of VOC contamination that were found to exist east of Colfax. This is because the Modpath© representation is simply showing direct, non-dispersed flow paths. If dispersion were introduced, the plume would be spread, with trace levels of contamination showing to the east of Colfax.

- The Modpath© plot shows the potential migration pathways for VOC contamination extending from the ACS site. Modflow© cannot represent a wetland where there is major groundwater discharge at the edge of the wetland and a flat gradient across the wetland. Therefore, the model projects "particles" along imaginary pathways that do not exist in the field. As a result, the model implies that contamination should be found further to the west than was actually found in the field screening investigation.

Nevertheless, the model is both sufficient and appropriate for 1) establishing the migration pathway of the groundwater contamination to the north and 2), determining the extent of extraction trench that will be necessary to capture the plume and prevent the off-site migration of VOCs to the north. As can be seen on the baseline model run (Figure 3), the groundwater flow pathways extend to the north and end where the groundwater discharges to the drainage ditch on the north side of the CSX railroad tracks. This is a close representation to the zone of benzene and acetone contamination indicated by the upper aquifer investigation (shown on Figure 1).

ACS-B Model Run (Original Extraction Trench)
The second model run was implemented to evaluate the potential effectiveness of the extraction trench as it was conceived in the 50 Percent Design document. It is evident from the pathlines, that the extraction trench will be effective in capturing the contaminant westward and northwestward from the ACS facility. However, the VOC plume migrating to the north, still extends to the ditch, north of the railroad tracks. Therefore, the extraction trench must be lengthened to the east to capture the plume migration to the north.

ACS-C Model Run (Extended Extraction Trench)
The purpose of the trench is hydraulic control and capture of the contaminated groundwater before it leaves the site. Hydraulic control does not necessarily require that the trench cut across the existing plume, to capture it. Rather, the trench must sufficiently alter the groundwater flow paths, so that the flow paths that were extending off site, will be turned and contained on-site.

Several different trench configurations were evaluated. Model run "ACS-C" is the model run in which the extraction trench was extended an additional 300 feet to the east. The plot of contour lines and particle tracks (Figure 5) shows that this will be sufficient to prevent the off site migration of contaminants in the upper aquifer. The flow paths are cut off and do not extend north of the CSX railroad tracks.

The model was set up to simulate a trench that lowers the static water level by one (1) foot. This was a conservative approach, so that the model would not over-predict the capability of the extraction trench. In reality, the system has been designed to lower the water table as much as four feet, if necessary. Consequently, the water treatment system has been designed to treat the volume of water that would be generated by lowering of the static watertable elevation by four feet. Sets of three piezometers, arrayed across the extraction trench at four locations, will be used to confirm that hydraulic containment is being attained. The proposed monitoring wells (E and F on Figure 1) will further confirm the effectiveness of the groundwater extraction trench.

The results of this analysis and modeling show that extending the groundwater extraction trench 300 feet farther to the east than planned in the 50 Percent Design, will be sufficient to establish and maintain hydraulic control of the upper aquifer on the ACS Site and prevent off-site migration of the contaminants. This conclusion will be field verified with piezometers and monitoring wells following system startup.

Attachments:

PJV/JDA
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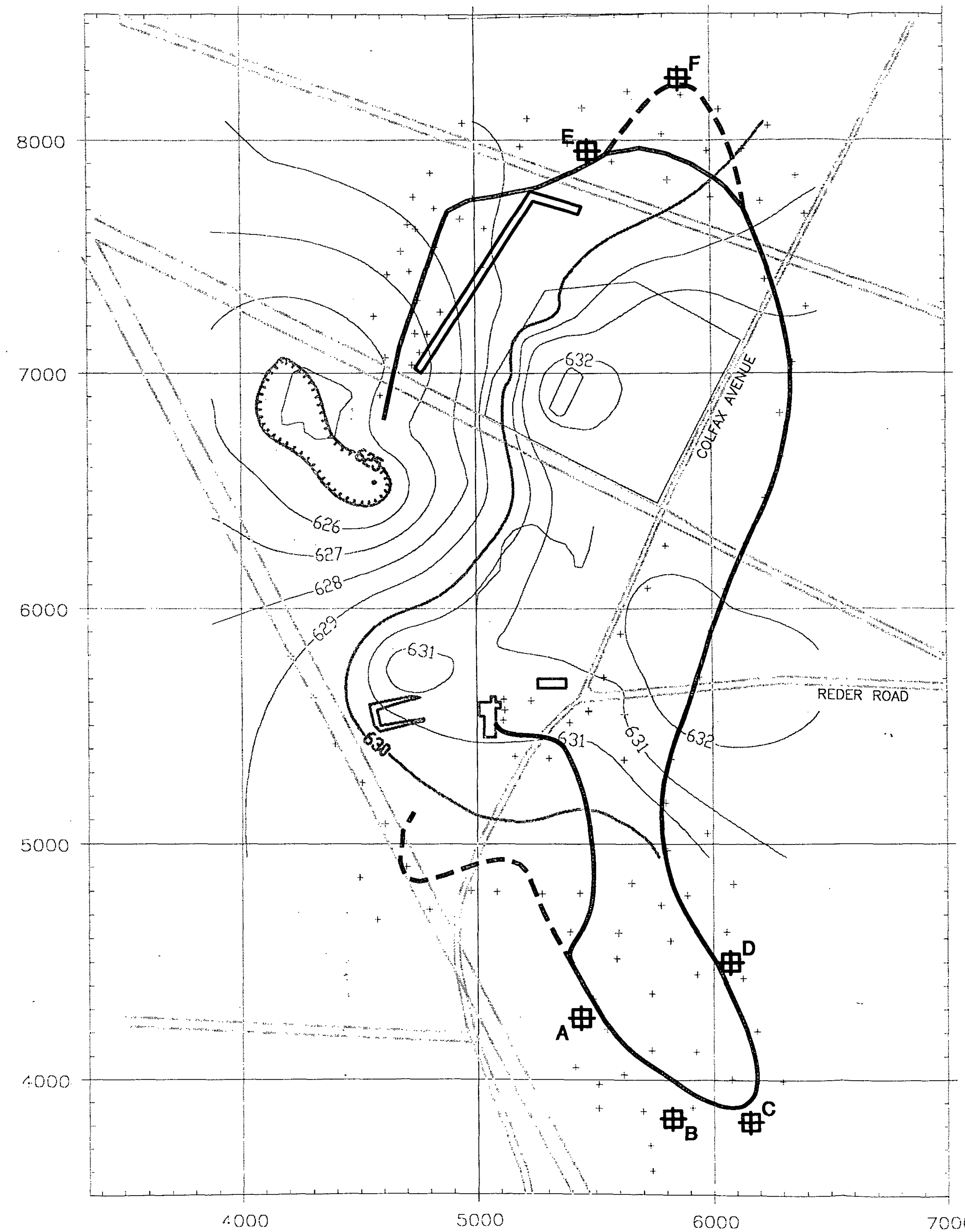
4077.0080



LEGEND

- A — PROPOSED UPPER AQUIFER MONITORING WELLS
- BENZENE CONCENTRATIONS LESS THAN 5 ppb
- ACETONE CONCENTRATIONS LESS THAN 50 ppb
- EXTRACTION TRENCH ALIGNMENT INCLUDED IN THE PGCS 50% DESIGN SUBMITTAL

north

0 500 1000

SCALE IN FEET

FIGURE 1

EXTENT OF GROUNDWATER CONTAMINATION IN THE UPPER AQUIFER

Drawn By CCM

Date 3/19/96

Developed By PV

Approved By

Reference

Revisions

Drawing Number 4077.0072 **B6**

MONTGOMERY WATSON

This document has been developed for a specific application and may not be used without the written approval of Montgomery Watson.

QUALITY CONTROL

Graphic Standards CCM 3-19-96

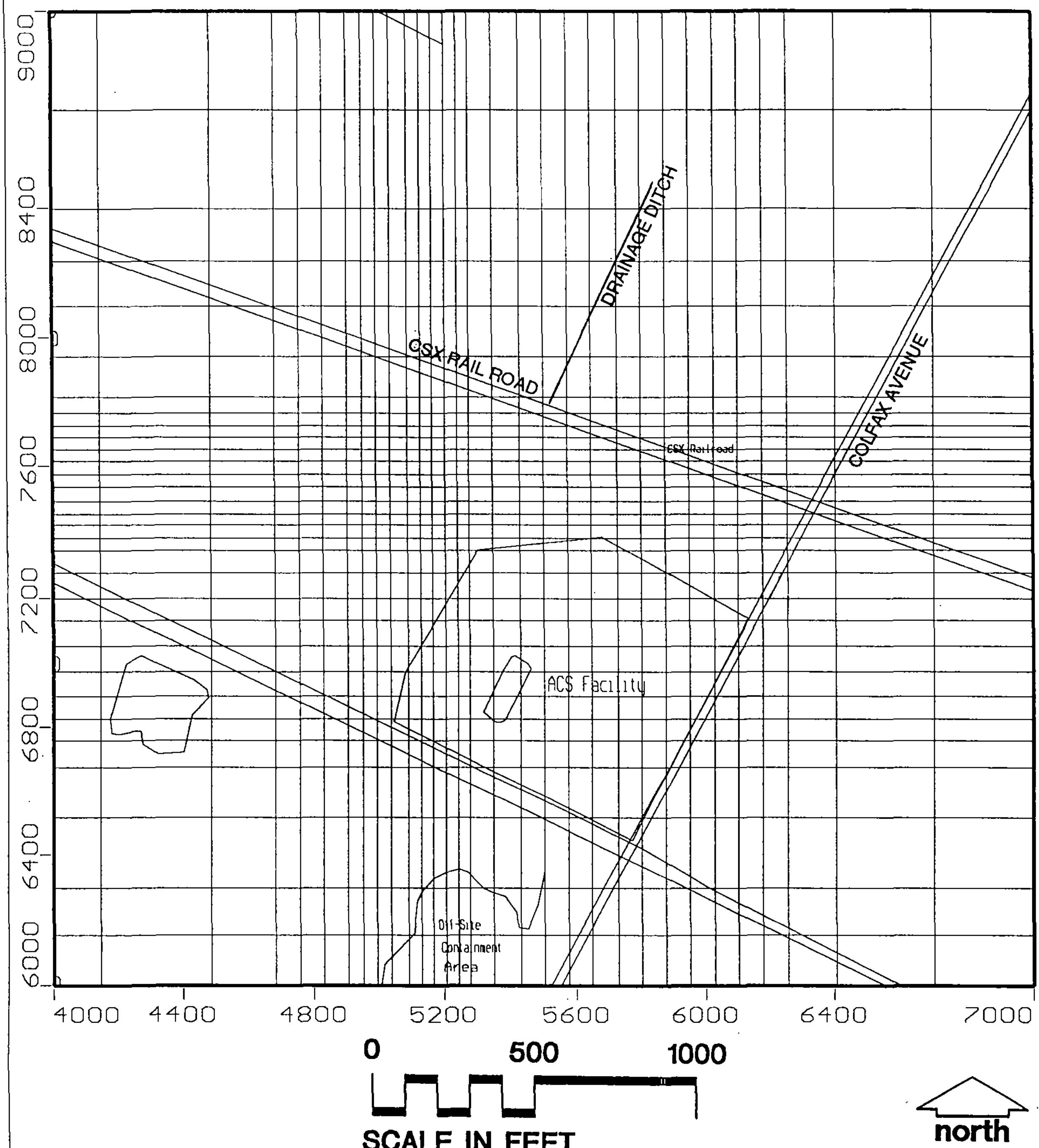
Lead Professional

Technical Review

Project Manager

Management Review

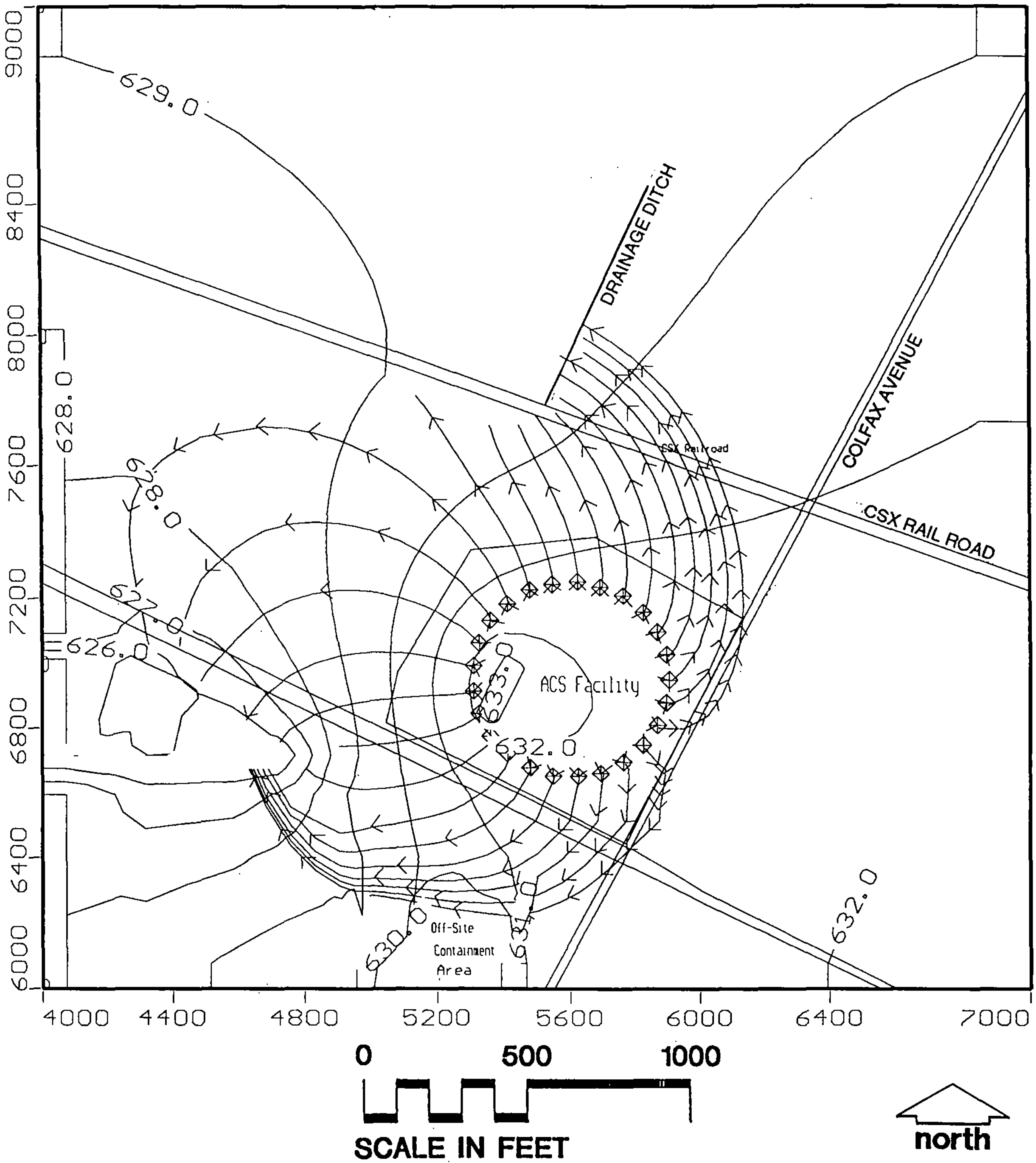
Other



Montgomery Watson
Project: ACS NPL Site RD/RA
Description: Baseline — No Extraction
Modeller: Run: ACS—A
18 Mar 96

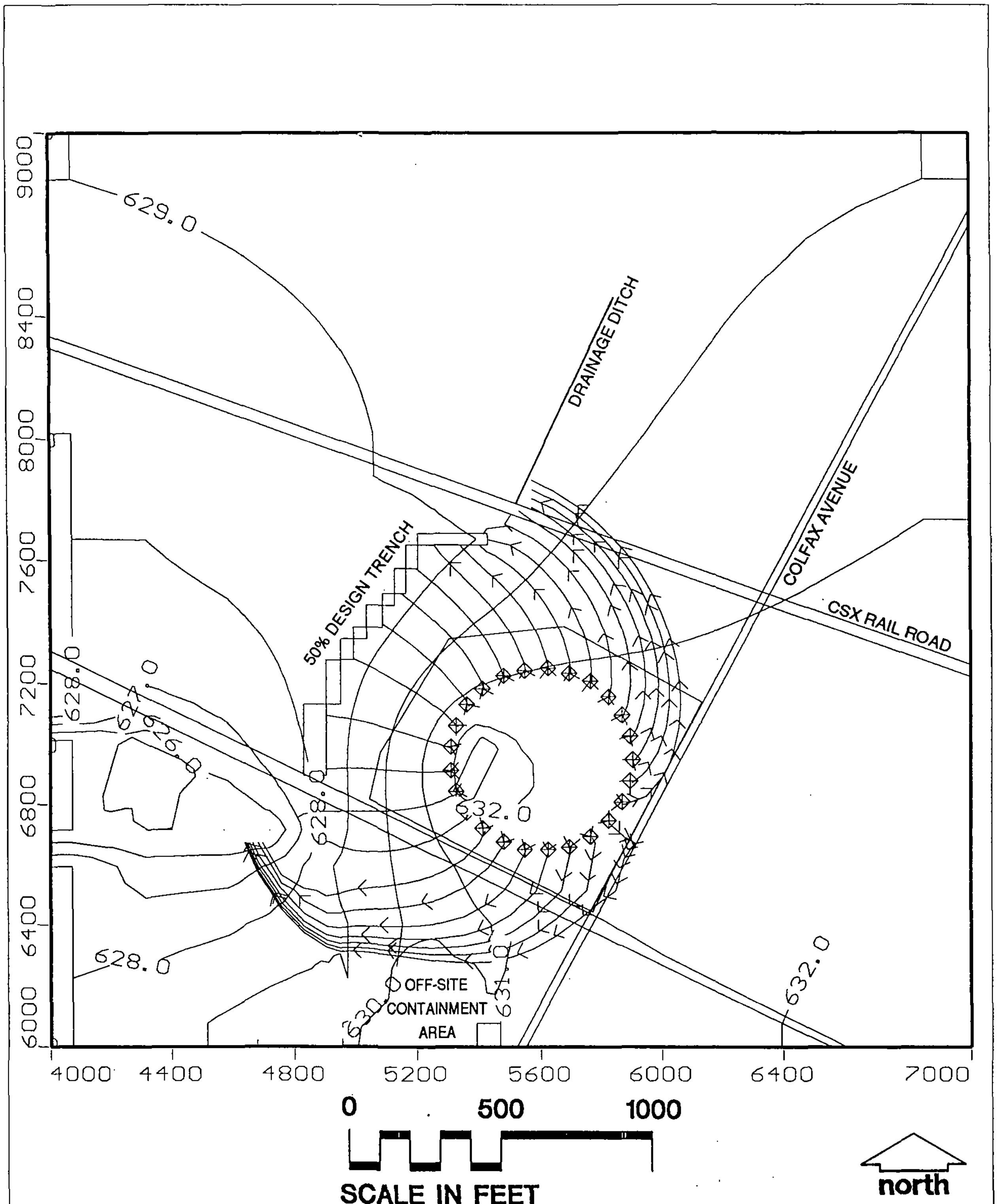
Visual MODFLOW v.1.50, (c) 1995
Waterloo Hydrogeologic Software
NC: 31 NR: 31 NL: 1
Current Layer: 1

FIGURE 2. Finite Difference Grid for Groundwater Modeling



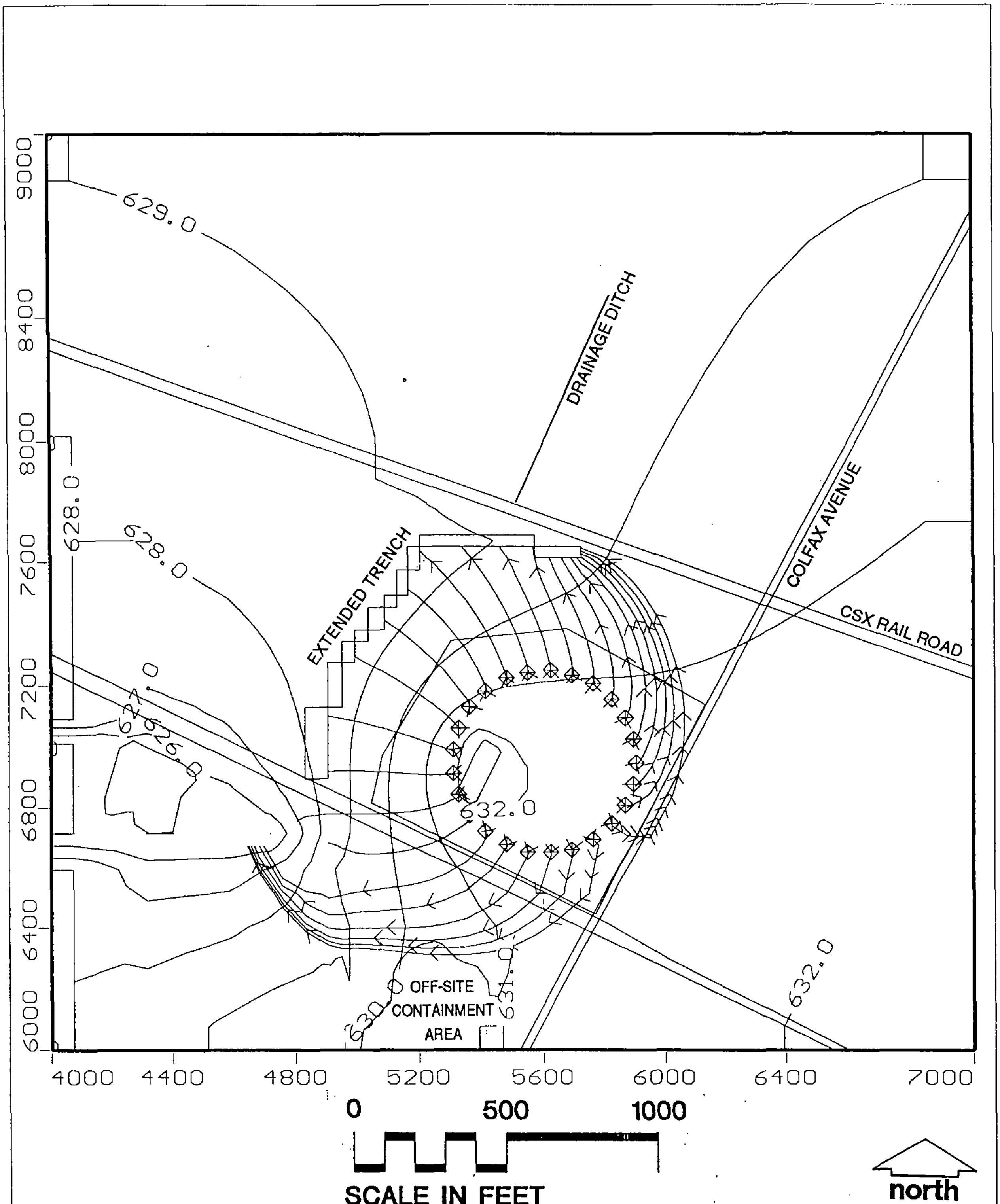
Montgomery Watson Project: ACS NPL Site RD/RA Description: Baseline – No Extraction Modeller: Run: ACS–A 18 Mar 96	Visual MODFLOW v.1.50, (c) 1995 Waterloo Hydrogeologic Software NC: 31 NR: 31 NL: 1 Current Layer: 1

FIGURE 3. Baseline Modeling Results



Montgomery Watson Project: ACS NPL Site RD/RA Description: 50% Design Ext. Trench Modeller: Run: ACS–B 18 Mar 96	Visual MODFLOW v.1.50, (c) 1995 Waterloo Hydrogeologic Software NC: 31 NR: 31 NL: 1 Current Layer: 1

FIGURE 4. Modeled Plume Capture by the Extraction Trench in the PGCS 50 Percent Design



Montgomery Watson Project: ACS NPL Site RD/RA Description: Extended Trench Modeller: Run: ACS–C 18 Mar 96	Visual MODFLOW v.1.50, (c) 1995 Waterloo Hydrogeologic Software NC: 31 NR: 31 NL: 1 Current Layer: 1

FIGURE 5. Modeled Plume Capture by the Extended Extraction Trench